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ABSTRACT

The role of certain personality and intellectual factors in the vocational adjustment of a sample of 133 vocational rehabilitation clients with a variety of problems was investigated. All subjects were administered the Minnesota Multiphasic Personality Inventory (MMPI), the Rorschach, the Kuder Personal Preference Record, and the Wechsler Adult Intelligence Scale (WAIS); in addition, selected demographic information was obtained. Several years later the sample was classified into three criterion groups: (1) rehabilitated (R); (2) nonrehabilitated due to physical considerations (NR-P); and (3) non-rehabilitated due to a "motivational" deficiency (NR-M). Among other findings, Group R members demonstrated relatively favorable psychological resources, both intellectual and emotional, had a slightly higher level of formal education, and were frequently unmarried. Results for the non-rehabilitated groups are included. A discussion of the value of the various testing measures for this client population concludes the paper. (Author/TL)

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THE RELATIONSHIPS OF CERTAIN PERSONALITY AND DEMOGRAPHIC VARIABLES TO SUCCESS IN VOCATIONAL REHABILITATION

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ABSTRACT

The major purpose of the project was to investigate the role of certain personality and intellectual factors in vocational adjustment. A sample of 133 California Bureau of Vocational Rehabilitation clients with a variety of physical problems were administered the Minnesota Multiphasic Personality Inventory, the Rorschach, the Kuder Personal Preference Record, and the Wechsler Adult Intelligence Scale; in addition, selected demographic information was obtained. Several years later the sample was classified into three criterion groups: rehabilitated, R (employed or attending school); non-rehabilitated due primarily to physical considerations, NR-P; and non-rehabilitated as a result of a "motivational" deficiency, NR-M. Group R members demonstrated relatively favorable psychological resources, both intellectual and emotional, had a slightly higher level of formal education, and were more frequently unmarried. The data pattern for the NR-M category suggested that only a marginal level of personal adjustment was present, and that the clients were usually married. Group NR-P resembled NR-M in many respects but appeared to be better adjusted psychologically. Using a subset of weighted variables, criterion status was predicted rather successfully; however, cross-validation is mandatory before the method can be used in the everyday rehabilitation setting.

INTRODUCTION

Statement of the Problem

The primary purpose of the project was to develop a technique for assessing rehabilitation potential based upon personality and intellectual factors. That is not to say that physical disability does not impose important limitations; however, it is well known that psychological complications often interfere with the rehabilitation process so that vocational and/or social adjustment is poor. The desired end result would be a relatively straightforward procedure whereby selected psychological and demographic variables would be weighted in proportion to predictive efficacy and would yield a derived score. On the basis of this measure the professional worker would then be able to make more realistic decisions about a candidate's readiness for and response to rehabilitation procedures. Such a system would in theory save the agency both time and funds. Even if the high risk cases were accepted, special attention or modified techniques might be implemented from the beginning with the aim of reducing the incidence of "failure."

Review of Selected Literature

While many surveys and discursive reviews of rehabilitation experiences from a variety of clinical settings have emphasized the necessity of understanding personality factors, only a few systematic attempts have been made to validate prognostic scales. The study of Ayer, Thoreson, & Butler (1966) examined the relationships of certain demographic data and the usual MMPI T-scores to several criterion measures. The sample consisted of information for 45 cases characterized by some form of emotional illness and 34 individuals with obvious physical disability, drawn from the files of a district office of the Department of Vocational Rehabilitation in Wisconsin. Criterion measures included occupational level, upward mobility, and closure status. The latter, closure status (employed and/or successfully trained persons vs. others), had a multiple correlation of 0.65 with the predictor variables. But, when considering correlations

between closure status and other independent variables individually, the only statistically significant finding was an r of -0.30 for age at time of application. The authors conclude that MMPI scales might be rendered more meaningful if a standardization were performed on a disability sample, a suggestion which will be mentioned again in a later section of the present report.

Less encouraging findings have been presented by Lowe (1967). A sample of persons who had been previously hospitalized with some form of psychiatric problem were tested using the WAIS, MMPI, and Rorschach. These data were compared to occupational status (gainfully employed vs. unemployed). Only 3 of 39 test scale comparisons were statistically significant, and not one of the three was confirmed when a cross-validation subsample was analyzed.

Another investigation (Nadler, 1957) sought to determine the predictive validity of prorated estimates of WAIS Verbal and Performance IQ's, and Bender-Gestalt scores, with respect to work performance of 53 older severely handicapped individuals. The correlations of WAIS-Verbal and WAIS-Performance scores with a measure of job performance were 0.51 and 0.54, respectively. Thus intellectual factors appeared to account for about 25% of criterion variance. The mean scores associated with the two WAIS variables were Verbal = 92.5 and Performance = 87.5; the author speculates that the relatively lower Performance IQ might be a function of the physical disability of the patient.

Manson (1953) attempted to predict rehabilitation outcome for a group of 30 male amputees at a V.A. hospital in California. It was concluded that fundamental differences in personality structure and dynamics were very important factors in rehabilitation activities.

The major purpose of a relatively successful study (Ehrle, 1964) was to devise an instrument based upon biographical data in order to predict eventual employment status. Items contained on the Missouri State Vocational Rehabilitation Form R-4 were the potential predictors. Using a differential weighting system, and two cross-validation samples, expectancy charts were established. One scoring key based upon only 20 variables, identified correctly 69% of the second cross-validation group.

Several conclusions may be drawn regarding the cited examples of research findings:

1. Certain personality and intellectual factors do indeed seem to play an important part in an individual's response to rehabilitation efforts.

2. Studies have usually been confined to either demographic or psychological predictors, but rarely both.

3. There is clearly a need to evaluate other types of psychological instruments (e.g., interest inventories and projective techniques) as potentially useful indicators of rehabilitation outcome.

METHOD

The Sample

All individuals making application to the Los Angeles office of the California Bureau of Vocational Rehabilitation were eligible for inclusion in the study, with the following exceptions:

1. Persons who were clearly mentally retarded (whose test results would have been questionable).

2. Persons who were blind, deaf, or otherwise had some impairment of communication ability so that the investigative procedures would have been inappropriate.

3. Persons whose primary disability was psychiatric.

4. Persons employed or attending school full-time at the time of application.

5. Persons who had previously received psychological testing from the Bureau.

6. Persons who had no telephone, and thus could not be contacted directly in order to ensure appearance for a research appointment.

The Bureau reported that such restrictions eliminated about

one-fourth of the applicants normally available. The present sample was selected from the six to twelve applicants per week who met the stated criteria. Once chosen, the individuals received a letter and then a phone call from the Bureau designating an appointment time and urging participation in the project.

The selection of cases was accomplished by the Director of the Bureau on the basis of information contained in case folders; the Director was not personally acquainted with any applicant, and the decision was made solely from filed information which was usually based on one intake interview. Excluding the exceptions as defined previously, two cases per week were chosen for inclusion in the present research. No rigid scheme for insuring randomness was in operation; however, comparison of the demographic and intellectual characteristics of the sample with statistics reflecting the total case load of the Bureau, indicated that a reasonably representative sampling was obtained.

The study sample (N = 133) had the following general characteristics:

1. Sex: 64% male, 36% female.

2. Marital status: 55% married, 25% single, and 20% divorced or widowed.

3. Ethnic group: 50% white, 35% Negro, and 14% Mexican or oriental.

4. Age: mean age of 39.3 years; ranged from 18 to 65.

5. Formal education: mean number of years was 10.89, with a range of fifth grade to four years of college.

6. Type of physical disability: orthopedic 36%, cardiac 15%, respiratory 25%, and other 25%.

Predictor Variables

In addition to the demographic variables just stated, the following psychological tests were administered:

1. The Wechsler Adult Intelligence Scale (WAIS).

2. The Kuder Personal Preference Record, Vocational, Form CM.

3. The Minnesota Multiphasic Personality Inventory (MMPI). In addition to the usual scoring (which yielded three validity scores, nine clinical scores, a Masculinity-femininity score, and a Social-introversion score), the Barron Ego-strength scale was included. Also, two supplementary indices were obtained for each client: number of clinical scales with T-scores of 70 or above, and the number of critical items selected in the pathological direction.

4. The Rorschach Technique. This well-known instrument was scored according to Klopfer's system.

Criterion Variable

Case folders of 153 clients were initially grouped into three categories in 1962: employed, unemployed, and other (the Bureau's own termination classification scheme). However, the simple employed-unemployed dichotomy did not permit identification of those cases whose unemployed status was due in large part to motivational or personality factors as opposed to instances where physical limitations had been the primary determinants. In addition, the Bureau's definition of employment status was based upon a short-term observation only. Clearly it was important to establish whether those clients who found initial employment were still working at a later date. For these reasons the Bureau's data on the study sample were examined again in 1964. File folders were carefully evaluated by a psychologist and a criterion judgment was made. Clients were assigned to one of four categories:

1. Rehabilitated. Employed or attending school full-time.

2. Non-rehabilitated, physical. Cases where the physical problem(s) alone was(were) judged to be sufficiently serious to prohibit employment. In fact, for approximately 50% of this subgroup, the disability was so significant that the demands of most vocations would have been a threat to the very existence of these clients.

3. Non-rehabilitated, motivational. Persons for whom a rehabilitation program was begun but they failed to follow through or were eventually terminated by the Bureau after several unsuccessful attempts to modify their rehabilitation programs. Often these

individuals did not keep appointments for counseling, and their counselors felt that they were generally uncooperative. Physical considerations did not appear to impose notable restrictions in activity. Like members of the second category, they were not employed.

4. Unassigned. These 20 people were not capable of being placed in one of the preceding classifications due to either a lack of relevant data (e.g., persons who moved without completing a program, died, etc.), or because there was not sufficient information on file for the psychologist to render a meaningful decision.

The sample frequencies and associated percentages in the various criterion categories were:

Rehabilitated (R)	86 (65%)
Non-rehabilitated, physical (NR-P)	20 (15%)
Non-rehabilitated, motivational (NR-M)	27 (20%)
Final total N	133

RESULTS

Methods of Analysis

Initially, each individual predictor was examined in regard to its association with the criterion variable. Once this was done, a discriminant analysis was performed in which a subset of independent variables were evaluated jointly in terms of predictive usefulness.

Several fundamental statistical techniques were chosen to analyze the data obtained in the present study, and are described below:

1. Biserial correlation. This statistic was designed to be used in situations where one of two variables is in fact continuously measurable, but for practical purposes has been dichotomized. In the present case it was both expedient and justifiable to assume that the criterion variable (rehabilitated vs. non-rehabilitated) was continuous; but in the absence of an adequate measuring instrument had been reduced to two basic categories.

As noted previously, the non-rehabilitated was further subdivided into two subgroups; for this reason the relation of each continuous predictor to the criterion variable was reflected in not one but three biserial correlations: the criterion groups were taken two at a time in all possible combinations and these dichotomies were correlated with the predictor involved.

2. Chi-square, Contingency Coefficient, and Median Test. The chi-square technique is designed for use when data occur in the form of frequencies as opposed to some form of continuous measurement. Typically each predictor which had only nominal measurement characteristics was contrasted with criterion status as defined in order to determine if the two variables in question were related. Proper interpretation of the resulting chi-square value provides information about the statistical significance of the apparent association in the contingency table, but there is no direct implication as to the strength of the association. Therefore, a contingency coefficient was calculated which does estimate the degree of relationship present.

Closely related to chi-square is the median test which was applied in the event that the predictor under consideration had at least ordinal properties and the sample distribution was obviously not symmetrical. A grand median for the entire sample was first computed; then the number of cases above and below the midpoint was determined for each criterion group; and finally, the chi-square computational formula was applied to the array of frequencies. A contingency coefficient was also calculated in every instance.

3. Discriminant Analysis. This method may be employed when a criterion variable is categorical and the predictors have at least ordinal characteristics. The technique involves weighting the predictors in such a manner that individuals are optimally classified in terms of criterion status. Additional details are provided later (see pp. 20-21).

Demographic Data

Table 1 summarizes the results of analyses which were at least marginally significant ($.10 > p > .05$). Age, ethnic status, and sex factors were not significantly related to criterion group membership. Marital status was analyzed by using the chi-square technique since data were in the form of frequencies. The obtained

value of chi-square was 9.094 which had an associated probability of $.10 > p > .05$. Inspection of the contingency table, and cell-square contingencies, indicated that there were a greater number

Table 1

Summary of Demographic Results which had at Least Marginal Statistical Significance

Variable	Groups Considered	Statistic	Statistic Value	Probability
Marital Status*	R, NR-M, NR-P	Chi-square	9.094	$.10 > p > .05$
Marital Status*	R, NR-M, NR-P	Contingency Coefficient	0.254	$.10 > p > .05$
Education**	R, NR-M	Biserial Correlation	0.322	$p < .01$
Education**	R, NR-P	Biserial Correlation	0.284	$p < .05$

*Sample Size: R = 85, NR-M = 27, NR-P = 20

**Sample Size: R = 84, NR-M = 27, NR-P = 20

of single persons in group R than would be expected on a chance basis, and fewer single persons in both groups NR-M and NR-P. Table 2 presents the observed frequencies for marital status as a function of criterion category.

The education variable was treated statistically by computing biserial correlations for the criterion groups taken two at a time. The value of the biserial correlation (r_b) for the comparisons between groups R and NR-M was 0.322 ($p < .01$), the mean number of years of formal education for group R being 11.30, and 10.07 for group NR-M. The R vs. NR-P comparison

Table 2

Frequency Distribution for the Marital Status Variable as a Function of Criterion Group

Marital Status	Criterion Group			Total
	R	NR-M	NR-P	
Single	28 (33%)	3 (11%)	3 (15%)	34
Married	40 (47%)	17 (63%)	15 (75%)	72
Other	17 (20%)	7 (26%)	2 (10%)	26
Total	85	27	20	132

yielded a value of r_b equal to 0.284 ($p < .05$), the NR-P group having a mean of 10.30 years. The NR-P vs. NR-M contrast was not significant. Taken as a whole the findings suggest that group R had a slightly higher mean formal educational level than did either groups NR-M or NR-P which were essentially equal. The study sample was rather homogeneous in terms of formal education, the total standard deviation being only 2.24 years.

Type of Disability

The sample contained persons having a rather wide range of physical disabilities; however, for purposes of analysis, the following disability groupings were established: (1) orthopedic, (2) cardiac, (3) respiratory, and (4) other. The requirements inherent in the chi-square technique, namely, acceptable minimum expected frequencies in any given cell, necessitated collapsing the NR-P and NR-M groups into a single non-rehabilitated group. Thus the resulting chi-square analysis was a 2 x 4 contingency table with the first classification refering to "rehabilitation" status, and the second was type of physical disability as indicated above. The obtained value of chi-square was equal to 4.083 ($p > .10$), and suggested that type of disability and "rehabilitation" outcome were not related.

A second analysis was conducted comparing "rehabilitation" category and the presence or absence of multiple disability. In the previous analysis the physical factor considered to be a major determiner of the disability was selected, and any other secondary physical problems were ignored. At this point persons were reclassified into two categories: (1) disability due to a single physical problem, and (2) disability due to multiple ailments. The result was a 2 x 2 contingency table, the first variable being disability status (either single or multiple), and the second factor was "rehabilitation" classification (rehabilitated vs. non-rehabilitated). The computed chi-square had a value equal to 0.776 ($p > .10$). Again it was concluded that the two factors were probably independent.

Considering the two previous analyses, one can conclude that "rehabilitation" status is probably not dependent upon either type or number of physical disabilities; even from a conservative point of view, this assertion seems applicable to the study sample.

Psychological Test Data

WAIS Measures. Table 3 presents the significant biserial correlations between criterion group and the various WAIS measures, and Table 4 indicates the mean scores. There was a consistent pattern of results for the R vs. NR-M comparisons: generally group R had higher mean Full Scale and Performance scores than did those in group NR-M. The mean Full Scale score for the R group was 100.43, while that associated with the NR-M group was 93.07; the mean Performance scores for the R and NR-M groups were 98.14 and 90.07, respectively. While not statistically significant at the .05 level, the correlation obtained for Verbal scores was 0.234 with an associated standard error of 0.124, the R group having a mean of 102.03 and the NR-M group mean being 96.33. Analysis of the subtests revealed that the R group had a significantly higher mean score on the Digit Symbol, Picture Completion, Block Design, Picture Arrangement, and Object Assembly subtests. Also, the R group had higher mean scores on the Information and Comprehension subtests as compared to Group NR-M.

The results of the comparisons between groups R and NR-P would seem to indicate that these groups did not differ reliably on WAIS measures with the exception of the Similarities subtest.

Table 3

Summary of Statistically Significant Results on WAIS Variables

Variable	Groups Considered	Statistic	Statistic Value	Probability
Full Scale	R, NR-M	Biserial Correlation	0.309	$p = .01$
Performance	R, NR-M	"	0.330	$p < .01$
Information	R, NR-M	"	0.306	$p < .05$
Comprehension	R, NR-M	"	0.337	$p < .01$
Similarities	R, NR-P	"	0.412	$p < .01$
Digit Symbol	R, NR-M	"	0.428	$p < .01$
Picture Completion	R, NR-M	"	0.301	$p < .05$
Picture Completion	NR-P, NR-M	"	0.328	$p = .05$
Block Design	R, NR-M	"	0.318	$p < .01$
Picture Arrangement	R, NR-M	"	0.285	$p < .05$
Object Assembly*	R, NR-M	"	0.300	$p < .05$

*Sample size: R = 86, NR-M = 26, NR-P = 20

All other: R = 86, NR-M = 27, NR-P = 20

Note. As is true for other psychological test data, the specified results do not reflect the complete set of statistical analyses performed; all possible predictor-criterion combinations were evaluated, but only those reaching statistical significance are listed.

Table 4

Mean Scores for WAIS Variables

Variable	Criterion Group		
	R	NR-M	NR-P
Full Scale	100.43	93.07	96.30
Performance	98.14	90.07	97.15
Verbal	102.03	96.33	95.90
Information	10.27	8.93	9.80
Comprehension	11.71	9.70	10.75
Arithmetic	9.74	9.19	8.70
Similarities	9.98	9.07	8.00
Digit Span*	8.96	8.78	7.95
Vocabulary**	10.26	9.27	9.70
Digit Symbol	8.08	6.33	7.20
Picture Completion	8.87	7.41	8.85
Block Design	9.16	7.70	8.80
Picture Arrangement	8.88	7.59	8.65
Object Assembly***	8.70	7.38	9.10

* Sample Size: R = 85, NR-M = 27, NR-P = 20
** Sample Size: R = 85, NR-M = 26, NR-P = 20
*** Sample Size: R = 86, NR-M = 26, NR-P = 20
All Other: R = 86, NR-M = 27, NR-P = 20

Comparisons of the NR-P and NR-M data suggest that WAIS measures did not differentiate these two groups. However, it should be noted that the value of r_b for the Performance score was equal to 0.318 with an associated standard error of 0.169, hence just falling short of the .05 level. In connection with this statement is the fact that the total sample size for the NR-P vs. NR-M comparisons was 47, a number about one-half as large as that for the other two possible criterion comparisons. With a total sample size as small as this, it is to be expected that the magnitude of the standard error will be elevated and given a descriptive interpretation, the conclusion that the NR-P vs. NR-M comparison for the Performance scale is sizeable for the study sample, is certainly warranted. The only other significant result was that for the Picture Completion subtest ($r_b = 0.328$); means for NR-M and NR-P were 7.41 and 8.85, respectively.

MMPI Measures. Tables 5 and 6 portray statistical comparisons and mean T-scores, respectively. The obtained biserial correlations suggest that the R group (mean = 63.14) was lower on the Depression scale than either the NR-M group (mean = 69.52) or the NR-P group (mean = 68.68). Analysis of the Barron Ego Strength (Es) subtest revealed an opposite trend: the means for the R, NR-M, and NR-P groups were 50.40, 46.27, and 43.61, respectively. The obtained biserial correlations for the Es scale that reached statistical significance ($p < .05$) were those for the NR-M vs. R comparison ($r_b = 0.285$), and NR-P vs. R ($r_b = 0.407$). The NR-P vs. NR-M comparison was not significant. Finally, the Hypochondriasis scale seemed to differentiate the R group and the NR-P group. The mean score for the R category was 62.04, and that for the NR-P category was 65.53. Analysis of the Masculinity-Femininity scale indicated that the means associated with the NR-P and NR-M groups were 53.26 and 59.30, respectively, with a significant r_b of -0.399 ($p < .05$). The latter finding should be interpreted cautiously since data for males and females were combined.

The number of clinical scales exceeding a T-score of 70 may be considered an indicator of gross pathology. A grand median was computed for the entire sample ($1 > Mdn > 0$), followed by construction of a contingency table which showed the number of persons above and below the grand median as a function of criterion group membership (see Table 7). The value of chi-square for this analysis was 5.719 ($.10 > p > .05$). The related

Table 5

Summary of at Least Marginally Significant Results for MMPI Variables

Variable	Groups Considered	Statistic	Value of Statistic	Probability
Hypochondriasis*	R, NR-P	Biserial Correlation	-0.287	$p < .05$
Depression*	R, NR-M	"	-0.313	$p < .01$
Depression*	R, NR-P	"	-0.266	$p = .05$
Masculinity-Femininity*	NR-P, NR-M	"	-0.399	$p < .05$
Ego Strength**	R, NR-M	"	0.285	$p < .05$
Ego Strength**	R, NR-P	"	0.407	$p < .01$
No. of Clinical Scales above 70*	R, NR-M, NR-P	Median Test	5.719	$.10 > p > .05$
No. of Clinical Scales above 70*	R, NR-M, NR-P	Contingency Coefficient	0.205	$.10 > p > .05$
No. of Critical Items*	R, NR-M, NR-P	Median Test	5.222	$.10 > p > .05$
No. of Critical Items*	R, NR-M, NR-P	Contingency Coefficient	0.196	$.10 > p > .05$

*Sample Size: R = 85, NR-M = 27, NR-P = 19
**Sample Size: R = 85, NR-M = 26, NR-P = 19

Note. The Masculinity-Femininity Scale results are probably invalid since separate analyses should be performed for males and females.

Table 6

Mean T-scores for the MMPI Variables

Variable	Criterion Group		
	R	NR-M	NR-P
K*	56.72	53.26	53.68
L*	54.19	52.85	54.16
F*	53.67	55.56	52.26
Hypochondriasis*	62.04	63.30	65.53
Depression*	63.14	69.52	68.68
Hysteria*	60.16	63.81	66.58
Psychopathic Deviate*	61.41	63.19	58.79
Masculinity-Femininity*	55.46	59.30	53.26
Paranoia**	53.47	53.31	52.53
Psychasthenia**	56.81	60.73	58.05
Schizophrenia**	57.31	57.92	56.16
Hypomania*	54.73	56.11	55.42
Social Introversion*	52.52	55.78	55.16
Ego Strength**	50.40	46.27	43.61

*Sample Size: R = 85, NR-M = 27, NR-P = 19
**Sample Size: R = 85, NR-M = 26, NR-P = 19

Table 7

Frequency Distribution for the Number of MMPI Clinical Scales with T-scores Above 70 as a Function of Criterion Group

	Criterion Group			
	R	NR-M	NR-P	Total
Above Mdn.	38 (45%)	19 (70%)	11 (58%)	68
Below Mdn.	47 (55%)	8 (30%)	8 (42%)	63
Total	85	27	19	131

Table 8

Frequency Distribution for the Number of Critical Items Selected on the MMPI as a Function of Criterion Group

	Criterion Group			
	R	NR-M	NR-P	Total
Above Mdn.	33 (39%)	17 (63%)	10 (53%)	60
Below Mdn.	52 (61%)	10 (37%)	9 (47%)	71
Total	85	27	19	131

value of the contingency coefficient was 0.205. Inspection of cell-square contingencies indicated that the NR-M group had a relatively greater number of individuals above the grand median than did either the R or NR-P group.

Another index of gross pathology consisted of the number of critical items selected on the MMPI. Once again a median test was performed ($2 > $ Grand Mdn. > 1) on the array of observed frequencies shown in Table 8. The resulting value of chi-square was 5.222 ($.10 > p > .05$), and the contingency coefficient was equal to 0.196. The R group was characterized by having a preponderance of cases below the midpoint, but the reverse was true for NR-M. Group NR-P was distributed about as expected by chance.

Kuder Personal Preference Record Data. It can be generally stated that criterion group category was not systematically related to the usual scales of the Kuder. Two significant correlations did emerge, however, with regard to the Verification scale. As can be seen in Table 9, the value of r_b for the R vs. NR-M comparison was 0.568, and that for the R vs. NR-P comparison was 0.312. The mean scale scores for the R, NR-M, and NR-P groups were 40.35, 37.05, and 38.26, respectively. Such low values indicate that the responses to the Kuder are of doubtful validity. Nevertheless, the mean scale scores for the various subtests of the Kuder are shown in Table 10.

A special Kuder score (Forer, 1951, 1953) was derived for each subject, and was determined in three steps. First, an over-all Adjustive score was calculated for every person and was simply the sum of scores obtained on the Outdoor, Mechanical, Computational, Scientific, and Clerical subtests. Then an over-all Expressive score was computed being the sum of scores on the Persuasive, Artistic, Literary, Musical, and Social Service subtests. Finally, a difference score was calculated by subtracting the Adjustive score from the Expressive score for every member of the sample (difference scores were corrected by adding a constant in order to eliminate negative values). The difference scores were subsequently subjected to a median test with the resulting value of chi-square being equal to 9.008 ($.02 > p > .01$). The associated contingency coefficient was 0.262. Examination of the contingency table indicated that there were a greater number of individuals above the grand

Table 9

Summary of Significant Statistical Tests on Kuder Variables

Variable	Groups Considered	Statistic	Value of Statistic	Probability
Verification*	R, NR-M	Biserial Correlation	0.568	$p < .01$
Verification*	R, NR-P	"	0.312	$p < .05$
Expressive-Minus-Adjustive Score**	R, NP-M, NR-P	Median Test	8.423	$p < .02$
Expressive-Minus-Adjustive Score**	R, NR-M, NR-P	Contingency Coefficient	0.523	$p < .02$

*Sample Size: R = 81, NR-M = 21, NR-P = 19
**Sample Size: R = 84, NR-M = 21, NR-P = 18

median in the NR-M group than expected, and the number of cases in the R group below the grand median was probably larger than could be attributed to chance factors. Table 11 presents the data array for the Kuder Expressive-minus-Adjustive scores.

Rorschach Data. The median test was employed to analyze the following response categories since in these cases frequency data were present: M, Fm, F, W, D, and R. Responses in the M category (human movement responses) were differentially related to criterion classification; the observed pattern of data is depicted in Table 12. The obtained value of chi-square was 8.039 ($.02 > p > .01$), and the contingency coefficient was 0.240. By inspection the number of persons in the NR-M group above the grand median ($2 > Mdn. > 1$) was fewer than could reasonably be expected on the basis of chance alone, while the number of persons in the R group above the midpoint appeared to be somewhat above the number dictated by chance. Further analysis of the F%, Sa%, A%, W%, and D% yielded no significant differences.

Table 10

Mean Scale Scores for the Kuder

	Criterion Group		
	R	NR-M	NR-P
Verification*	40.35	37.05	38.26
Mechanical	38.30	39.52	45.74
Computation	57.74	58.62	55.89
Scientific	46.24	50.86	52.37
Persuasive	46.77	38.76	45.63
Artistic	52.04	45.76	44.84
Literary	45.44	44.43	38.00
Musical	50.59	42.86	53.79
Social Service	66.23	64.43	73.74
Clerical	54.94	62.43	55.89
Outdoor	38.13	36.71	37.00

*Sample Size: R = 81, NR-M = 21, NR-P = 19
All Other: R = 82, NR-M = 21, NR-P = 19

Table 11

Frequency Distribution for Kuder Expressive-minus-Adjustive Scores as a Function of Criterion Group

	Criterion Group			
	R	NR-M	NR-P	Total
Above Mdn.	32 (39%)	15 (71%)	12 (63%)	59
Below Mdn.	50 (61%)	6 (29%)	7 (37%)	63
Total	82	21	19	122

Table 12

Frequency Distribution of Rorschach Human Movement Responses as a Function of Criterion Group

	Criterion Group			
	R	NR-M	NR-P	Total
Above Mdn.	45 (53%)	6 (22%)	8 (40%)	59
Below Mdn.	40 (47%)	21 (78%)	12 (60%)	73
Total	85	27	20	132

Other possible categories of response were not statistically treated due to the very small number of people actually making such responses.

Discriminant Analysis

The technique of discriminant analysis has been described in detail by Anderson (1958). Essentially the method involves

computing a set of linear functions for the purpose of classifying a person into one of several groups, the assignment being made on the basis of the largest estimated probability density. Since the rehabilitation criterion was categorical in nature, the discriminant analysis appeared to be the most suitable multivariate procedure available.

The predictor variables selected included: Age; number of years of formal education; WAIS Full Scale, Verbal, and Performance scores; MMPI-K, L, F, Hs, D, Hy, Pd, Mf, Pa, Pt, Sc, Ma, Si, and Es; and Kuder Verification and Expressive-minus-Adjustive scores. Thus a total of 21 predictor indices were employed. The number of subjects in the R, NR-M, and NR-P groups for this analysis were 81, 21, and 19, respectively (persons with two or more predictors missing were excluded from the analysis, while those having only one score missing were retained and the value was estimated from the remaining data of the criterion group to which the individual belonged).

The resulting coefficients listed by predicted classification category are specified in Table 13, along with calculated constants to be added[1]. Multiplying each predictor score by the associated coefficient, and then summing the products for all 21 predictor variable-coefficient combinations, yields a probability value which indicates the likelihood that a given individual is in the particular criterion group. A probability estimate is determined for each of the three possible criterion classifications for every person; the individual is then assigned to a predicted criterion group on the basis of the largest calculated probability value. Table 14 compares predicted classification from the discriminant function to the actual rehabilitation classification. For the R group, 51 (63%) cases were assigned correctly; the NR-M group had 14 (67%) people identified accurately; and 11 (58%) NR-P individuals were appropriately classified. This information provides the basis for estimating the predictive strength which is gained by using the indicated discriminant technique as compared to the condition where no such information is available. Assuming a person were drawn at random from a

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[1]The discriminant analysis was performed at Western Data Processing Center, University of California at Los Angeles, using an IBM 7094 computer system. The authors are indebted for the assistance and cooperation received at the Center.

Table 13

Discriminant Coefficients and Constants for Selected Predictor Variables Used to Determine Criterion Status

Variable	Discriminant Coefficient for the Criterion Groups		
	R	NR-M	NR-P
Age	0.11390	0.19952	0.11872
Education	0.47590	0.50976	0.50066
WAIS-Full Scale	-2.36762	-3.27338	-2.25598
WAIS-Verbal	1.45425	1.98012	1.34437
WAIS-Performance	1.06248	1.41143	1.04542
MMPI-K	0.16896	0.16816	0.18703
MMPI-L	0.07600	0.03983	0.06384
MMPI-F	0.23985	0.14533	0.18526
MMPI-Hs	0.04007	0.03516	0.03579
MMPI-D	-0.12033	-0.06025	-0.02706
MMPI-Hy	0.07452	0.00472	0.08952
MMPI-Pd	0.04158	0.03938	0.00315
MMPI-Mf	0.08573	0.13983	0.06472
MMPI-Pa	0.07682	0.05513	0.05011
MMPI-Pt	0.05014	0.08663	0.01945
MMPI-Sc	-0.06640	-0.06993	-0.09930
MMPI-Ma	0.07170	0.13862	0.15261
MMPI-Si	0.29190	0.33468	0.32303
MMPI-Es	0.31806	0.33204	0.23591
Kuder-Verification	0.50015	0.44152	0.36807
Kuder-Exp.-minus-Adj.	-0.02660	-0.05536	-0.04255
Constant	-57.88231	-58.75788	-49.49881

Table 14

Comparison of Predicted vs. Actual Rehabilitation Status Using the Discriminant Analysis

		Predicted Classification			Total
		R	NR-M	NR-P	
Actual Classification	R	51 (63%)	15	15	81
	NR-M	2	14 (67%)	5	21
	NR-P	5	3	11 (58%)	19
Total		58	32	31	121

hypothetical population having the characteristics of the study sample, the "best" guess of rehabilitation classification (under conditions of no predictor information) would be that the individual was in group R, the associated probability being 0.669. The probability of error in making this prediction would be 1 - 0.699, or 0.331; but the error rates for NR-M and NR-P groups would be 100% since the selected strategy effectively ignores these classifications. Assuming now that the obtained predictor information is available for use, the conditional probability (the probability that a person is actually rehabilitated given that the predicted category is R) becomes 0.879. Similar conditional probabilities, and hence conditional error probabilities, were calculated for the NR-M and NR-P classifications. Finally, an estimate of the average probability of error was determined, being equal to 0.226. These intermediate computations were then entered in the following equation in order to obtain the index of predictive association, λ, as outlined by Hays (1963):

$$\lambda = \frac{p\ (\text{error} \mid \text{predictor unknown}) - p\ (\text{error} \mid \text{predictor known})}{p\ (\text{error} \mid \text{predictor unknown})}$$

The index shows the proportional reduction in the probability of error gained by specifying the predictor information. For the obtained data,

$$\lambda = \frac{0.331 - 0.226}{0.331} = 0.317$$

Thus knowing the predicted classification by using the discriminant function improves ability to predict the actual rehabilitation status, the probability of error being reduced by approximately 32%. The advantage of this method of evaluation resides in the fact that an estimate of predictive strength is determined directly rather than a simple statistical significance statement which often implies very little about the ability to make practical predictions.

The results from the discriminant analysis should be regarded as <u>suggestive</u> only, in large measure due to the very small numbers of cases in the NR-M and NR-P categories. Before such a method is used in the everyday rehabilitation setting, it is mandatory that a cross-validation study be performed; in this way it may be ascertained whether or not the predictor-criterion relationship is a stable one. As is usually the case, some shrinkage in the error reduction probability stated above should be expected. With these cautions in mind it is still justifiable to conclude that the discriminant method may well be a valuable asset to the rehabilitation professional in the future when the necessary refinements have been achieved.

DISCUSSION

<u>The WAIS</u>

Analysis of the Full Scale IQ, Performance IQ, and Verbal IQ indicated that group NR-M had a lower mean on the first two measures than did group R. Verbal IQ means for groups R and NR-M were not different from a statistical point of view, despite the fact that the NR-M mean was lower.

Inspection of the subtest means revealed two conspicuous patterns. First, while not supported by statistical evaluation, group NR-P had consistently lower mean scores on all Verbal subtests than did group R. In terms of Performance subtests, group NR-M means

were invariably below those for group R; such a finding is not particularly surprising since Performance IQ's were dissimilar, but the lack of even one reversal is impressive.

Wechsler (1958) indicates that a marked discrepancy between Verbal and Performance IQ's in favor of the former, is commonly found when some form of mental disorder is present. One should <u>not</u> immediately infer that this was the case for members of group NR-M. As Wechsler goes on to say, the educational and vocational history of a person may be important factors in the relationship between the two IQ measures. Additionally, cultural differences could be implicated. The obtained data were also consistent with the information presented by Nadler (1957). As will be recalled, he mentioned that a lower Performance IQ may be attributable to the physical disability per se.

There is no ready means of distinguishing between the various alternatives specified above. Perhaps it is advisable simply to conclude that the NR-M group did differ reliably from group R in one aspect (Performance) of measured intellectual capacity. This inference, relatively unsophisticated as it may be, is indeed important in relation to the prediction of rehabilitation outcome.

<u>The MMPI</u>

The MMPI data were quite interesting. For all three criterion groups the neurotic triad--Hypochondriasis (Hs), Depression (D), and Hysteria (Hy)--was elevated, but particularly so for groups NR-M and NR-P. Of three statistically reliable comparisons within this triad, two involved the D scale, with groups NR-M and NR-P having a higher mean T-score than was the case for group R, and the third was the R vs. NR-P comparison on the Hs scale (NR-P mean > R mean). Such a configuration has been observed by Moos and Solomen (1964) in a group of patients suffering from rheumatoid arthritis. In general, one would expect such an elevated triad in the event of physical disability accompanied by discernable organic pathology. Perhaps more common in the literature is the "conversion-V" pattern (elevated Hs and Hy with D relatively lower). The latter has been found to be associated, for example, with individuals having low-back syndromes (Phillips, 1964), and psychogenic backache (Hanvik, 1951).

The markedly lower mean Ego-strength (Es) scores for groups NR-M and NR-P as compared to the mean R value, is readily interpreted. Barron (1956) has stated that high Es scores have been associated with one or more of the following: personal stability, independence of judgement, an adequate sense of reality, effectiveness in social situations, and high intelligence. Also, there appears to be evidence for a negative correlation between Es scores and the tendency to develop psychiatric symptoms. Certainly, then, the relatively low scores achieved by groups NR-M and NR-P would not seem to be conducive to successful vocational rehabilitation.

With respect to the two measures of gross pathology (number of clinical scales above a T-score of 70, and the number of critical items checked in a pathological direction), members of group NR-M more often responded in a less favorable way than did individuals in both R and NR-P. If one assumes that these measures are suggestive of at least some degree of psychiatric symptom formation, then the consistency with the Es data is obvious.

When all the MMPI data are considered, it was apparent that groups NR-M and NR-P were very similar, with two exceptions, namely, a higher mean D and the elevated indices of gross pathology for NR-M. In a predictive sense, then, it would be difficult to distinguish between the two non-rehabilitated categories. But, the differences between group R and either NR-M or NR-P were definitely more pronounced.

The Kuder

The nature of the mean scores on the Verification scale indicated that responses to the instrument were of questionable validity, especially so for groups NR-M and NR-P. Bearing in mind the necessity for cautious interpretation, the Expressive-minus-Adjustive data are now discussed.

Refering once more to Table 11, the outstanding deviation from chance expectation was due to the preponderance of NR-M members above the grand median. Stated in an alternate fashion, most individuals in group NR-M emphasized Expressive categories rather than Adjustive choices. Forer (1951, 1953) has contended that Kuder profiles may reflect not only occupational potential but can render insights into emotional adjustment. Expressive

scales are concerned with activities that allow free personality expression along with a minimum adherence to socially dictated criteria. An Adjustive pattern is characterized by activities requiring development of skills through study and practice under relatively formal and standard conditions. Forer, commenting upon his study of 400 disabled veterans, concluded that an emphasis on Expressive interests is indicative of maladjustment. The relevance to the data obtained for the study sample is certainly clear: NR-M cases did tend to stress Expressive choices and were "maladjusted" in the sense that they were not employed or attending school full time. Although not nearly as marked, there was a reverse trend for group R persons--fewer had strong inclinations for Expressive preferences, and by definition, had experienced a more satisfactory vocational status.

Even though not statistically significant, group NR-P had a mean Social Service score of 73.74 which was higher than the comparable means for NR-M and R. Forer (1953) argued that this kind of elevation in disabled groups is probably an expression of interpersonal anxiety, and Newman (1955) arrived at the same conclusion for a group of tuberculosis patients.

The Rorschach

The only measure which served to differentiate the criterion groups was the frequency of human movement (M) responses. It will be recalled that group NR-M members typically were located below the grand median and there was a suggestion that the opposite was true for group R individuals. Klopfer, Ainsworth, Klopfer, and Holt (1954) state that a high number of M responses may be associated with: (1) a high level of ego functioning; (2) superior intellectual capacity; (3) an effective degree of inner control and hence stability; (4) adequate self-acceptance accompanied by a capacity for delayed gratification in the interest of long-range goals; and (5) satisfactory empathy. Conversely, low M production could be indicative of a state of affairs in which functioning in non-creative activities would be possible, while emotional and social adjustment are marginal. It is well to bear in mind that M incidence was not very high for the total sample ($2 > \text{grand median} > 1$), so that inferences are strictly relative to the present research setting. When considered in conjunction with previous data (Kuder Expressive-minus-Adjustive scores, MMPI indices of gross pathology, and

WAIS data), it would seem justifiable to predict that the typical NR-M individual would not have an overabundance of personal resources, either intellectual or emotional, and rehabilitation potential would be marginal at best.

Concluding Considerations

One serious problem in the present study involved the manner in which sample size varied for the criterion groups. The NR-M vs. R and NR-P vs. R comparisons involved a much larger total sample than was the case for NR-M vs. NR-P contrasts. Thus one would expect the latter situation to result in significant statistical findings being relatively infrequent, all other things being equal. It would have been more reassuring had NR-M vs. NR-P differences emerged in a greater number of analyses; then one would be confident that two truly distinct populations had been sampled. Nevertheless, the results were sufficiently definitive to conclude that the typical individual in NR-M was quite different from a representative person in NR-P.

Future investigations should consider the proposal of Ayer et al. (1966). A re-standardization of psychological tests for disabled populations might well enhance the chances of detecting differential personality characteristics. The suggestion would appear to be applicable to settings which are like the present study and involve comparisons of subgroups from a physically disabled universe.

The results of the discriminant analysis were encouraging, and with additional research efforts in the future, could become a valuable instrument for the rehabilitation counselor. Once identified, the potential clients with "motivational" deficits presumably would be placed in special programs--the methods and implementation of such techniques remain in the realm of speculation at the moment, however.

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